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ELECTRICAL POWER MANAGEMENT SURVEY MANUAL

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

ELECTRICAL POWER MANAGEMENT SURVEY MANUAL

September 1, 1965

Performance Analysis and Control
Apollo Program Office
National Aeronautics and Space Administration
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Abstract

The Electrical Power Management Survey Manual provides procedures for a management audit of NASA Apollo Program contractor activities, assesses performance towards objectives, evaluates effectiveness of the management system, and where weaknesses exist, it provides a tool for determining corrective action. This amplifies Electrical Power Management Standard NASA SP-6005, June 15, 1965.

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INTRODUCTION

To assure effective planning, optimization, and control of the Apollo Space Vehicle electrical power management program, it is imperative that each center, contractor, and sub-contractor develop and maintain efficient electrical power management systems. Confidence in the effectiveness of the electrical power management program can only be assured by the qualitative evaluation of the adequacy of the established electrical power management systems. Such evaluations, to be practical and worthwhile, must include the necessary elements of planning, conducting, reporting, and follow-up.

This manual is presented as an aid in meeting the requirements of those NASA managers concerned with functions related to electrical power management and as such provides guidance, procedures, instructions, and work sheets for surveillance as well as more thorough periodic management surveys.

This manual was prepared by the Performance Analysis and Control Office (Code MAP-2) of the Apollo Program Office, NASA, Washington, D.C.

The techniques developed herein can readily be converted to meet evaluation requirements in other areas, e.g., the Weight/Performance Management Survey Manual, (NASA SP-6006). Instrumentation, thermal control and vibration, shock, and acoustics are other typical examples.

WHY THIS EFFORT?

In the interest of attaining true program electrical power management this formal management survey provides an audit of NASA and contractor activities, assesses performance toward objectives, evaluates effectiveness of relationships between participating organizations and, where problems exist, provides a tool for determining corrective action.

Prior to assessing a electrical power management system it is necessary to specify:

Objectives

The results of the management survey must provide a full measure of current and projected status, identify weaknesses, and establish remedial actions.

Policies

Basic ground rules or guides must provide assurance that desired goals and objectives will be attained.

Plans

It is necessary to transform the objectives and policies into a systematic working document which delineates a realistic schedule of survey events, identifies areas of concern, and establishes a technical and administrative approach.

Standards of Measurable Performance

The results of the survey must be expressed in readily recognizable quantitative terms, preferably a proficiency rating (PR).

UTILIZING THE RESULTS

The survey will provide results which define the administrative as well as the engineering deficiencies. Accordingly, cognizant NASA managers will obtain valuable insight into existing and probable contractor weaknesses; and will be in a better position to take actions essential to the solution of electrical power management problems.

The ultimate worth of the obtained results will be a direct function of the effort extended by the survey team in planning and executing its assigned task.

OBJECTIVES

Six areas of concern must be investigated to ascertain electrical power management system status, weaknesses, and desired remedial actions. They are:

a. Planning: Recognition and proper phasing of each and every action necessary to attain electrical power objectives.

b. Communications: Policies and procedures (instructions, work orders, information flow system, etc.) defining authorities and responsibilities sufficiently to direct, control, conduct, and administer the electrical power management system.

c. Disciplines: Adequacy of managerial discipline and organization in requiring compliance with plans, policies, and procedures necessary to attain electrical power management objectives.

d. Training and Education: Sufficiency of details of who, why, what, when, where, and how of electrical power management provided to responsible personnel at all levels.

e. Judgments: Soundness, prudence, and practicality of decisions made in carrying out the electrical power management system plans, policies, procedures, information flow, and technical aspects.

f. Technical knowledge and ability to perform engineering functions, including electrical power analyses and evaluations of system performance, in compliance with specifications and standards.

These areas of concern can be measured quantitatively through an analysis, based on a series of evaluation questions, resulting in an overall "Proficiency Rating." This is covered in detail in the "Standards of Measurable Performance" section.

POLICIES

Technical Approach

The evaluations will be accomplished by a team of responsible representatives of cognizant center engineering groups, and supported by the MSF/Apollo Program Office in the role of amicus curiae. The evaluation consists of nine steps, starting with the selection of the team, and ending with the final report containing the results of all action items.

Team Function

Each team member will be assigned primary and secondary areas of responsibility. He will, at the conclusion of the evaluation, prepare an informal report for the chairman, covering his primary area of responsibility, and critique the report covering his secondary area of responsibility. The final report is prepared by the chairman, and critiqued by the team members. The chairman is also responsible for scheduling the events and meetings required for the evaluation, and for making necessary arrangements with the contractor.

Prerequisites

The evaluation of any area of a contract is a task which must, once the decision is made to proceed, be accomplished with a minimum perturbation to the contractor's effort. The evaluation team, to properly discharge its responsibilities, must be fully and completely prepared for the task; therefore, the prerequisites are an essential part of the evaluation. How the evaluation goes, and how successful the team is, will depend entirely on how well they are prepared.

Modus Operandi

The evaluation shall be conducted in nine basic steps, starting with the selection of the team members and ending with the submittal of the final report. Therefore, adherence to the basic procedures is strongly recommended for consistency and assistance in the required follow-on actions.

The prerequisites, agenda, and work sheets presented should be critiqued and amended for applicability to the particular contract being evaluated. The relative importance of the six areas (noted under "objectives") should be established and noted on the work sheets of Table I prior to the evaluation.

End Item Reports

An objective summary of the evaluation, emphasizing the areas of concern, will be prepared for management immediately following the evaluation. This summary will, in addition to reviewing the actual evaluation, contain a complete listing of all incomplete action items, with a schedule for resolution. A complete report will follow the summary after all action items are complete, and will contain additional recommendations and a follow-up schedule.

Follow-up

Follow-up evaluations should be conducted by the same team, whenever possible, to determine the effectiveness of the recommendations and action items, and to provide continuous surveillance of the program.

PLANS

Team Selection (step one)

It is desirable to utilize a small group of competent individuals with the team chairman from the cognizant project or chief engineer's office. Suggested areas of team specialist representation and responsibility are:

A. Electrical Power Management

B. Electrical Power Design Groups

C. Systems Engineering

D. Contracts

E. Project Office

Initial Meeting (step two)

An initial meeting of the team is required to:

A. Explain the objectives of the evaluation, and the responsibilities of team members.

B. Make assignments of primary and secondary areas of responsibility.

C. Establish a schedule of events for the evaluation. (This will provide each team member with the relationship of his inputs to those of the other team members.)

D. Prepare a preliminary agenda for the meeting with the contractor.

Team Actions (step three)

In accordance with the developed schedule it is necessary to assure that: (1) sufficient background data will be available for the team members to prepare for the visit to the contractor's facility, and (2) the contractor will have sufficient time to respond to the notice of evaluation. To accomplish these objectives adequately, the following items should be considered:

I. The chairman informs the contractor, through official channels, of the evaluation, including objectives and expected cooperation. Notification will include:

A. Definite date of team visit to contractor's facility in accordance with the developed schedule.

B. A preliminary agenda, with a request for additional items that the contractor considers relevant to such an evaluation, and schedule for submittal.

II. The chairman prepares, and distributes to the team members, a preliminary outline of the final report. See Table III for Sample Outline.

III. Team members compile:

A. Background data in support of the survey agenda and final report.

1. CONTRACT REQUIREMENTS — Exact requirements imposed on the contractor and delineation of information on informal or working agreements; control requirements imposed on the contractor (e.g., NASA SP-6005 Electrical Power Management Standard or equivalent), submittal requirements and specification requirements.

2. RESPONSE TO REQUIREMENTS

a. Evaluation of submittals (Should include completeness, validity, and timeliness of submitted data.)

b. Supplemental data — Does the contractor respond to requests for supplemental data?

3. COMPARATIVE DATA

a. Trend relationship between contractor-submitted data and contractual requirements.

b. Compatibility of measured data with calculated and estimated data.

4. PROBLEM AREAS

a. Current, past, and possible future problems based on NASA/Contractor relationships to date.

b. Remedial actions and their effectiveness in solution of prior problems.

B. Detail outline of informal report of assigned area of responsibility in accordance with the preliminary final report outline noted in II above.

IV. Agenda

The chairman prepares final agenda, with supporting checklist, considering contractor's response to request for additional items.

A. Purpose

1. The agenda shall cover the steps which are necessary to obtain and substantiate the answers to questions covering all classifications in the Qualitative Evaluation Sheets.

B. Recommended Basic Agenda

1. SESSION I

a. Attendees

(1) NASA personnel

(2) Contractor personnel

b. Purpose

(1) Chairman will discuss agenda items, purpose of evaluation, and anticipated results.

(2) Contractor personnel will present to NASA the material which they have prepared to assist in the survey.

2. SESSION II

a. Attendees

(1) Session II will consist of separate simultaneous sessions of NASA personnel responsible for each Classification, meeting with contractor personnel cognizant in each Classification.

b. Purpose

(1) Discuss in detail each Classification of Electrical Power Management. Obtain answers to all questions in Qualitative Evaluation Sheet for each Classification.

(2) Examine substantiating evidence for answers to questions, where applicable, (i.e.,records of deliveries and documentation submittals, test equipment calibration records, substantiation of vendor and subcontractor electrical power management sufficiency, etc.)

3. SESSION III

a. Attendees

(1) All personnel present at Session I.

(2) Any additional personnel as determined to be necessary to meet the purpose of Session III.

b. Purpose

(1) Clear up any questions remaining unanswered by Session II, particularly in areas involving interfaces among Classifications. (May include additional presentations, therefore a time allocation should be made to cover this contingency.)

(2) Resolve any conflicts between question answers and substantiating evidence.

(3) Assign Action Items to Contractor by NASA where necessary to substantiate or clear up any items as required to meet all requirements of the survey.

(4) Summation of survey activities.

V. Final agenda is provided to team members and contractor.

Team Meeting (step four)

A. Review by the chairman of the objectives, responsibilities, and assignments.

B. Review the agenda, and make any adjustments required as a result of investigations made in the development of the background data, and contractor's response to notification of evaluation.

C. Background data distributed to team, accompanied by any discussion necessary for clarity and understanding by the team members.

Initial Meeting with Contractor (step five)

A. Chairman discusses purpose and scope of survey (Session I of agenda).

B. The contractor makes his presentation in accordance with the requirements of Session I of the agenda.

C. Team specialists hold "depth interviews" (Session II of agenda) with contractor representatives.

Team Meeting (step six — Held immediately following Session II of agenda).

A. Review of findings, with a determination of:

1. Items not covered.

2. Items covered, but not to the satisfaction of team specialists.

3. New items, resulting from initial meeting with contractor.

B. Notification to contractor of:

1. Additional presentations required.

2. "Depth interviews" with specific individuals or groups required.

C. Identification of all action items with assignment of responsibility for resolution and/or recommendations.

Final Meeting with Contractor (step seven)

A. Additional presentations and/or "depth interviews" with cognizant contractor representatives. (First item of Session III of Agenda.)

B. Assignment of action items, includes identification and scope of contractor or customer responsibility, and determination of schedule for a resolution or recommendation.

Team Actions (step eight, upon return to NASA installation)

A. Resolution and/or recommendation of action items assigned.

B. Draft of assigned informal report.

C. Critique draft of secondary assignment.

D. Submit any recommendations and/or comments relative to the evaluation.

Completion of Assignment (step nine)

A. Chairman completes and edits final draft of report and summary of open items.

B. Report submitted to distribution.

STANDARDS OF MEASURABLE PERFORMANCE

The Proficiency Rating

Placing a "Proficiency Rating" (PR) upon an organization and its electrical power management system requires a quantitative approach. To do this a set of 99 basic evaluation questions, Table I, have been assembled. These questions when answered and rated, result in both an administrative and an engineering PR rating. The administrative PR rating provides a measure of the contractor's planning, communications, discipline, training and education, judgment, and technical know-how. The engineering PR rating provides a measure of engineering management with respect to:

1. Preparedness and Attitudes
2. Formulation of Requirements
3. Formulation of the Electrical Power Management System
4. Electrical Power Analysis
5. Design Monitoring
6. Subcontractor and Vendor Surveillance
7. Measured Data
8. Electrical Power Control Assurance
9. Submittals

The results of the administrative and engineering evaluation allows the survey team to pinpoint weaknesses. It is through this media then, that NASA management can make constructive recommendations to the contractor. Additionally, the survey points out to NASA where contractual action should be taken to effectively resolve critical conditions.

The Evaluation Technique

The evaluation is relatively straight-forward in that the previously noted questions are used to determine the depth and scope of the contractor's electrical power management effort. The survey team may augment the basic questions with leading inquiries of greater detail, but the ultimate goal should always be to obtain responses to the basic question. Detailed probing will allow the team to rate the contractor's basic response in a more efficient manner. A word of caution is in order, however, since too many detail questions will only serve to cloud the issue.

Rating the Answers (See Table I)

To the right of each question there is a block similar to the one shown here. This is the answer rating block.

+	Y	-	+	N	-

Since all basic questions require only a yes or no answer, the survey team's task becomes one of determining the quantitative worth of the yes or no response. This is accomplished by utilizing lead questions as previously noted and interpreting the answers quantitatively by rating them to the plus, middle, or negative side of yes (Y) or no (N). The survey team may circle one of the individual blocks during the course of the interview once the question is answered. For example:

+	Y	⊖	+	N	-

After the survey is completed the circled answers are rated numerically as follows:

10	8	6	4	2	0
+	Y	-	+	N	-

For example, a negative yes is evaluated as six. A negative no is worth zero. The numerical value should be placed next to the circled block but only when the survey is completed. The maximum worth of any classification is ten times the number of questions. Therefore, if there are four questions the rating could vary between zero and forty, and is accomplished by adding the individual question ratings. The rating given to each classification is entered on the Proficiency Rating Form, Table II. Summing the individual totals and dividing by 990 results in an overall PR rating and completes the quantitative rating. The higher the PR the more adequate the contractor's electrical power management effort. The highest or best rating is 100 percent.

A Final Word

The proficiency rating so obtained is regarded as a sound measure of the depth and scope of the contractor's effort. However, there are times when a critical situation may exist and be so detrimental to project and program objectives that the proficiency rating cannot accentuate it adequately. For example, if a contractor is not submitting data (i.e., none at all) in accordance with NASA requirements, a special condition exists and warrants a special report which should immediately be brought to the attention of cognizant parties for corrective action. In essence, a contractor's effort may be efficient and expeditious but NASA cannot determine this unless it receives a tangible end product, namely the required submittals.

TABLE I

Evaluation Questions

QUALITATIVE EVALUATION NO._____ DATE _____

CENTER _____ CONTRACTOR _____

CONTRACT NO._____ STAGE/MODULE _____

RATING OFFICIAL _____
Name and Title

Classification: 1. PREPAREDNESS AND ATTITUDES

Objective: To review the contractor's overall responsiveness
(These questions should be answered after the survey.)

a. Planning
(1) Was the contractor adequately prepared for the survey in accordance with the NASA agenda? | + | Y | - | + | N | -

b. Communications
(1) Were contractor position and policy statements, and responses to NASA questions consistent at all management and engineering levels? | + | Y | - | + | N | -

c. Disciplines
(1) Did the contractor support the survey by expeditiously assuring the availability of cognizant personnel to answer inquiries or to acquire requested documentation? | + | Y | - | + | N | -

d. Training and Education
(1) Was there an awareness at all management and engineering levels of the importance and meaning of electrical power management? | + | Y | - | + | N | -

e. Judgements
(1) Were the responses to the majority of the questions straightforward and sound rather than evasive with little foundation? | + | Y | - | + | N | -

f. Technical
(1) Was the contractor's preparation for the technical aspects of the survey evident in detail discussions and/or contractor prepared material? | + | Y | - | + | N | -

QUALITATIVE EVALUATION NO._____DATE_____

CENTER_____CONTRACTOR_____

CONTRACT NO._____STAGE/MODULE_____

RATING OFFICIAL_____
Name and Title

Classification: 2. FORMULATION OF REQUIREMENTS

Objective: To determine the existence of requirements, procedures, and documentation essential to effective electrical power management.

a. Planning
(1) Are electrical power requirements traceable through all levels of contractor and related NASA documentation? (This includes contracts, standards, specifications, and substantiating reports as applicable to contractors, sub-contractors, vendors, and government furnished equipment.)

+	Y	-	+	N	-

b. Communications
(1) Are established electrical power requirements or subsequent revisions expeditiously transmitted to the cognizant engineering elements?

+	Y	-	+	N	-

c. Disciplines
(1) Are electrical power requirements and revisions coordinated at all applicable contractor and NASA management and engineering levels?

+	Y	-	+	N	-

d. Training and Education
(1) Does the contractor have documented procedures and guidelines for implementing and maintaining an effective electrical power management?

+	Y	-	+	N	-

e. Judgments
(1) Are the contractor's interpretations of documented requirements consistent with a governing Electrical Power Management Standard (SP-6005 or equivalent)?

+	Y	-	+	N	-

f. Technical
(1) Does the contractor have documented analyses and evaluations which substantiate existing requirements?

+	Y	-	+	N	-

QUALITATIVE EVALUATION NO._____DATE_____

CENTER_____CONTRACTOR _____

CONTRACT NO._____STAGE/MODULE _____

RATING OFFICIAL _____
Name and Title

Classification: 3. FORMULATION OF THE ELECTRICAL POWER MANAGEMENT SYSTEM

Objective: To establish the depth and scope of the planning, organization, and control of the electrical power management system.

a. Planning

(1) Does the contractor have a planned (i.e., a key event and milestone schedule) electrical power management program? | + | Y | - | + | N | - |

(2) Does the plan provide for studying, analyzing, documenting, reporting, and controlling electrical power properties? | + | Y | - | + | N | - |

(3) Does the plan provide for automatic data processing (or other acceptable accounting procedures), drawing sign-offs, measurements, and subcontractor and vendor surveillance? | + | Y | - | + | N | - |

(4) Does the plan provide for the establishment and control of changes to requirements (i.e., minimum voltage, peak power required, etc.)? | + | Y | - | + | N | - |

b. Communications

(1) Is the contractor's electrical power management organization on distribution for all documentation pertaining to or affecting electrical power? | + | Y | - | + | N | - |

(2) Do key electrical power management organization members actively participate in cyclic meetings of design review committees, change control boards, and/or project staff? | + | Y | - | + | N | - |

(3) Does the system provide for direct (i.e., unfiltered) internal electrical power status reporting to all functional areas, and all applicable management levels up to and including the project manager? | + | Y | - | + | N | - |

c. Disciplines

(1) Does the project electrical power management organization have full responsibility for the electrical power management program (i.e., no split responsibilities with staff groups)? | + | Y | - | + | N | - |

(2) Is the identity and management level of the contractor's electrical power management organization easily determined from organizational charts (i.e., no integration of electrical power management organization elements with other functional areas)? | + | Y | - | + | N | - |

(3) Is the electrical power management organization adequately staffed and organized (i.e., accounting, electrical power control and analysis, measurement, and administrative elements) to effectively accomplish the electrical power management program? | + | Y | - | + | N | - |

(4) Does the manager of the electrical power management organization have access to top management to make recommendations and obtain decisions on electrical power problems? | + | Y | - | + | N | - |

d. Training and Education

(1) Does the electrical power management organization actively (i.e., through posters, charts, brochures, handbooks, and/or classroom instructions) provide the who, what, why, and methods of electrical power management to functional design elements as well as the appropriate project management elements? | + | Y | - | + | N | - |

(2) Is the training and education program to be maintained on a continuous basis throughout the lifetime of the project? | + | Y | - | + | N | - |

e. Judgments

(1) Are the decisions which involve electrical power made within the framework of performance, cost, schedule, and reliability trade-off effects? (A positive answer should be supported by actual documentation.) | + | Y | - | + | N | - |

(2) Are management decisions affecting electrical power agreed to by cognizant electrical power management personnel? | + | Y | - | + | N | - |

f. Technical

(1) Is the contractor's electrical power management program effective through the conceptual, definition, design, test, and checkout phases and in compliance with NASA approved standards and/or specifications? | + | Y | - | + | N | - |

(2) Does the electrical power management organization have cognizance over (or access to) electrical power trade-off assessments, and corresponding electrical power evaluations? | + | Y | - | + | N | - |

QUALITATIVE EVALUATION NO._____DATE_____

CENTER_____CONTRACTOR_____

CONTRACT NO._____STAGE/MODULE_____

RATING OFFICIAL_____
Name and Title

Classification: 4. ELECTRICAL POWER ANALYSIS

Objective: To determine the extent and adequacy of contractor performed design optimization, trade-off and requirement analyses as applicable to electrical power.

a. Planning
   (1) Is there an overall project development plan which provides for continuous design assessments to optimize electrical power properties (i.e., are hardware problems under continuous assessment or are they solved only when they become critical)? | + | Y | - | + | N | - |

b. Communications
   (1) Does the electrical power management organization supply analytical inputs to design review, change control, and project staff meetings? | + | Y | - | + | N | - |
   (2) Is the electrical power management organization sufficiently informed of the results of such meetings to implement effective follow-up actions? | + | Y | - | + | N | - |

c. Disciplines
   (1) Does the electrical power management organization include a technical analysis element? | + | Y | - | + | N | - |

d. Training and Education
   (1) Are the electrical power control and analysis techniques, and result matrices documented and readily understood by the laymen? | + | Y | - | + | N | - |
   (2) Have the developed techniques and typical results been provided to cognizant NASA elements for review and comment? | + | Y | - | + | N | - |

e. Judgments
   (1) Have management and design decisions involving electrical power been based on technical assessments (within the purview of cost, schedule, performance, and reliability)? | + | Y | - | + | N | - |

(2) Is the time lag from the decision date to actual implementation reasonable (i.e., not greater than two working days)?

+	Y	-	+	N	-

f. Technical

(1) Have design constraint ground rules and quantitative values been established in sufficient depth to allow specification electrical power criteria to be defined and evaluated?

+	Y	-	+	N	-

(2) Have analyses of electrical power uncertainties been accomplished for use in overall system error analyses, to verify nominal values analytically, and to assist in identifying elements of hardware requiring test verification (a positive answer requires tangible evidence of such studies)?

+	Y	-	+	N	-

(3) Do the contractor's electrical power assessments provide for the early detection of potential weaknesses and system interface incompatibilities through systematic trend evaluations of system growth and performance changes?

+	Y	-	+	N	-

(4) Are the performed assessments (i.e., in reference to established specification, contract end item, and/or scope change quantitative definitions) compatible with the results of NASA technical assessments?

+	Y	-	+	N	-

QUALITATIVE EVALUATION NO._____ DATE_____

CENTER_____ CONTRACTOR_____

CONTRACT NO._____ STAGE/MODULE_____

RATING OFFICIAL_____
Name and Title

Classification: 5. DESIGN MONITORING

Objective: To establish the depth and scope of the contractor's electrical power design monitoring activity.

a. Planning

(1) Are all functional systems continuously monitored (i.e., on a scheduled basis) for electrical power changes? | + | Y | - | + | N | - |

(2) Are functional system design reviews held on a regular basis? | + | Y | - | + | N | - |

(3) Has the electrical power management organization prepared a status of each specification and drawing to anticipate workloads and to pinpoint gaps or items in process? | + | Y | - | + | N | - |

b. Communications

(1) Does the cognizant electrical power analyst participate in and/or receive the results of the functional system review? | + | Y | - | + | N | - |

(2) Is the cognizant NASA element informed of problems brought to the fore in the review which may compromise established specifications or other contractual requirements? | + | Y | - | + | N | - |

(3) Is the electrical power management organization on automatic and prompt distribution for all indexes, drawings, specifications, changes, and parts lists issued by the contractor's and subcontractor's engineering and drafting groups? | + | Y | - | + | N | - |

(4) Does it appear that the electrical power management organization is at all times in complete communication with the remainder of the engineering department and drafting groups? | + | Y | - | + | N | - |

c. Disciplines

(1) When the electrical power management organization <u>does not</u> concur with the drawing, design specification, or change, do they transmit their comments directly to the originating unit, and is subsequent communication documented until a satisfactory resolution of the problem is obtained? | + | Y | - | + | N | - |

(2) Is the electrical power management organization included in the contractor's engineering sign-off procedure? | + | Y | - | + | N | - |

(3) Do all drawings and changes indicate date of review, the reviewer, and do they include an electrical power block? | + | Y | - | + | N | - |

(4) Does the electrical power management organization monitor all project electrical power activities (i.e., technical, administrative, manufacturing, test, and field efforts)? | + | Y | - | + | N | - |

d. Training and Education

(1) Are the design monitoring procedures and techniques documented, readily understood, and available to personnel receiving on the job training? | + | Y | - | + | N | - |

(2) Are the aforementioned procedures straight-forward, feasible, and a true representation of the electrical power management organization's design monitoring activity? | + | Y | - | + | N | - |

e. Judgments

(1) Are the reasons advanced by the contractor in justification of his mode of design monitoring sound and practical in the overall engineering sense? | + | Y | - | + | N | - |

(2) Will the contractor's method of design monitoring provide results which will support sound management decisions? | + | Y | - | + | N | - |

f. Technical

(1) Are percents of estimated, calculated, and actual figures an integral part of the electrical power management system? | + | Y | - | + | N | - |

(2) Is there an adequate procedure for entering figures into a control log after a specific item of hardware has been released from manufacturing? | + | Y | - | + | N | - |

(3) Is the electrical power management organization's accounting of released drawings compatible with the drawing release schedule? | + | Y | - | + | N | - |

(4) Are standard forms, formats, and analysis procedures utilized in performing the design monitoring effort (e.g., NASA SP-6005 or equivalent formats)? | + | Y | - | + | N | - |

QUALITATIVE EVALUATION NO. _____ DATE _____

CENTER _____ CONTRACTOR _____

CONTRACT NO. _____ STAGE/MODULE _____

RATING OFFICIAL _____
Name and Title

Classification: 6. SUBCONTRACTOR AND VENDOR SURVEILLANCE

Objective: To determine the effectiveness and scope of the electrical power management program being enforced by the contractor on subcontractors and vendors.

a. Planning

(1) Does the contractor have a plan for monitoring subcontractor electrical power efforts? | + | Y | - | + | N | - |

(2) Do the contractor's procurement specifications, purchase orders and/or specification drawings clearly specify limiting electrical power limits which must be met or bettered? | + | Y | - | + | N | - |

(3) Are the subcontractors (i.e., for major items of hardware) contractually obligated to follow electrical power management requirements similar to NASA SP-6005 or its equivalent? | + | Y | - | + | N | - |

b. Communications

(1) Is the contractor's electrical power management organization reponsible for monitoring subcontractor and vendor efforts? | + | Y | - | + | N | - |

(2) Is there a clearly defined procedure for assuring compliance with established requirements? | + | Y | - | + | N | - |

(3) Do the periodic subcontractor design reviews include a review of the electrical power management effort? | + | Y | - | + | N | - |

c. Disciplines

(1) Does the contractor's electrical power management organization or its representative have authority (i.e., within the limits of the contract) to direct the subcontractor and vendor electrical power effort? | + | Y | - | + | N | - |

(2) Is the contractor satisfied with the subcontractor's electrical power management effort? | + | Y | - | + | N | - |

(3) Does the subcontractor meet minimum discipline standards similar to those required of the contractor in item C of classifications 2 thru 5 and 7 thru 9? | + | Y | - | + | N | - |

d. Training and Education

(1) Does the subcontractor meet minimum electrical power training and education requirements similar to those requirements of the contractor in item d. of classifications 2 thru 5, and 7 thru 9?

+	Y	-	+	N	-

e. Judgments

(1) Does the subcontractor meet minimum judgment standards similar to those delineated in item e. of classifications 2 thru 5, and 7 thru 9?

+	Y	-	+	N	-

f. Technical

(1) Does the subcontractor meet minimum technical standards similar to those delineated in item f. of classifications 2 thru 5, and 7 thru 9?

+	Y	-	+	N	-

QUALITATIVE EVALUATION NO._____DATE_____

CENTER_____CONTRACTOR_____

CONTRACT NO._____STAGE/MODULE_____

RATING OFFICIAL_____
Name and Title

Classification: 7. MEASURED DATA

Objective: To establish the adequacy and quality of the contractor's electrical measurement program.

a. Planning

(1) Does the contractor have a planned (i.e., a key event and milestone schedule) electrical properties measurement program? | + | Y | - | + | N | - |

(2) Does the plan provide for analyses to establish the requirements for measurements, for facility accuracy verification (i.e., calibration and attendant error analyses), for electrical measurement result documentation, subsequent data reduction, and final reporting? | + | Y | - | + | N | - |

b. Communication

(1) Does the contractor's electrical power management organization have cognizance over all electrical measurements (i.e., in the sense of having prepared or concurred in measurement procedures and ultimately receiving the results of said measurements)? | + | Y | - | + | N | - |

(2) Are the results of said measurements transmitted to NASA as required by NASA SP-6005 or its equivalent? | + | Y | - | + | N | - |

c. Disciplines

(1) Are procedures for the electrical measurement of incoming equipment and contractor fabricated hardware strictly enforced? (An affirmative answer requires a documented procedure which includes periodic quality control checks.) | + | Y | - | + | N | - |

(2) Is a NASA representative (at least an inspector) present when specification requirements are to be verified? | + | Y | - | + | N | - |

d. Training and Education

(1) Are electrical measurements performed by qualified personnel? (An affirmative answer should be verified by a personnel checkout or training record.)

+	Y	-	+	N	-

e. Judgments

(1) Has the contractor performed studies to support his judgments on which electrical properties (including sub-assemblies equipment and total vehicle) require verification?

+	Y	-	+	N	-

(2) Has the contractor developed, acquired, and maintained electrical measurement equipments and/or facilities that are consistent with the precisions, accuracies, and/or tolerances to which he is contractually obligated?

+	Y	-	+	N	-

f. Technical

(1) Have facility accuracies been verified (i.e., are approved facility error analyses and calibration reports available)?

+	Y	-	+	N	-

(2) Have all measurement procedures been approved by NASA in accordance with NASA SP-6005 or its equivalent?

+	Y	-	+	N	-

QUALITATIVE EVALUATION NO._____ DATE_____

CENTER_____CONTRACTOR_____

CONTRACTOR NO._____STAGE/MODULE_____

RATING OFFICIAL_____
Name and Title

Classification: 8. ELECTRICAL POWER CONTROL ASSURANCE

Objective: To determine if the contractor is exerting sufficient effort to design and fabricate vehicle stages and modules to meet or better specification electrical power requirements.

a. Planning

(1) Does the contractor's electrical power management plan provide for the establishment of procedures for detecting electrical power weaknesses before they become critical? (Refer to classification 4. item f. 3.)

+	Y	-	+	N	-

b. Communications

(1) Are detected anomalies communicated directly to project management, cognizant engineering groups, and NASA representatives?

+	Y	-	+	N	-

c. Disciplines

(1) Does project management take prompt action in effecting trade-off and alternate design analysis when specific electrical power properties are shown to have a high probability of exceeding specification limits?

+	Y	-	+	N	-

d. Training and Education

(1) Has the contractor provided sufficient evidence and knowledge of trade-off assessments which are predictive in nature?

+	Y	-	+	N	-

e. Judgments

(1) Have the judgments made to date by the contractor in assuring the meeting or bettering of electrical power requirements been sound and timely? (This can be verified by examining actual measurement records and comparing them to target, control limit, or specification requirements.)

+	Y	-	+	N	-

f. Technical

(1) Has the contractor developed and applied analytic procedures and techniques to verify and optimize electrical power trade-offs? (An affirmative answer requires tangible evidence in the form of reports.)

+	Y	-	+	N	-

QUALITATIVE EVALUATION NO._____ DATE_____

CENTER_____ CONTRACTOR_____

CONTRACT NO._____ STAGE/MODULE_____

RATING OFFICIAL_____
Name and Title

Classification: 9. SUBMITTALS

Objective: To determine the adequacy and timeliness of the contractor's internal and external (NASA) electrical power reporting system.

a. Planning

(1) Does the contractor's submittal schedule conform to that of NASA SP-6005 or its equivalent? | + | Y | - | + | N | - |

(2) Does the contractor disseminate internal status reports in accordance with a planned schedule? | + | Y | - | + | N | - |

(3) Are reports submitted to NASA on a vehicle serial number basis? | + | Y | - | + | N | - |

b. Communication

(1) Are the formats and functional codes of NASA SP-6005 or its equivalent adhered to by the contractor? | + | Y | - | + | N | - |

(2) Are the internal reports furnished to the functional design groups of sufficient depth to assure immediate understanding of existing or predicted electrical power problems? (They should include current status, trends, targets, control limits, and performance trade-off effects as appropriate.) | + | Y | - | + | N | - |

c. Disciplines

(1) Has the contractor made a concentrated effort to meet scheduled submittal dates? (This can be verified by checking NASA dates of receipts.) | + | Y | - | + | N | - |

(2) Is the internal reporting schedule reasonably adhered to? (This can be verified by reviewing the contractor's file copies of internal reports.) | + | Y | - | + | N | - |

d. Training and Education

(1) Do the reports submitted to NASA and the contractor's internal reports meet minimum professional standards? (Do they reflect an understanding of overall electrical power management requirements?) | + | Y | - | + | N | - |

e. Judgments

(1) Do the reports submitted to NASA consistently reflect the design base to which they are referenced? (This can be verified by reviewing the contractor's qualifying statements and technical descriptions contained in said reports.)

+	Y	-	+	N	-

f. Technical

(1) Does the contractor provide detail electrical power analyses as required by NASA SP-6005 or its equivalent?

+	Y	-	+	N	-

TABLE II PROFICIENCY RATING FORM

OBJECTIVES / CLASSIFICATION	a PLANNING	b COMMUNICATIONS	c DISCIPLINES	d TRAINING & EDUCATION	e JUDGMENTS	f TECHNICAL	IV SUM a THRU b	V DIVIDE IV BY V AND ENTER IN VI	VI ENGINEERING PROFICIENCY
1 PREPAREDNESS AND ATTITUDES								60	
2 FORMULATION OF REQUIREMENTS								60	
3 FORMULATION OF MASS PROPERTIES CONTROL SYSTEM								170	
4 MASS PROPERTIES ANALYSIS								120	
5 DESIGN MONITORING								190	
6 SUB-CONTRACTOR AND VENDOR SURVEILLANCE								120	
7 MEASURED DATA								110	
8 MASS PROPERTIES AND PERFORMANCE ASSURANCE								60	
9 SUBMITTALS								100	
I SUM 1 THRU 9							VII *	VIII DIVIDE VII BY 990 ENTER IN IX	IX OVERALL ENG. & ADM. PROF.
II DIVIDE I BY II AND ENTER IN III	190	190	190	120	130	170			
III ADMINISTRATIVE PROFICIENCY									

* SUM OF COL. IV (must equal sum of line 1)

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TABLE III - FINAL REPORT - SAMPLE OUTLINE

ELECTRICAL POWER MANAGEMENT SURVEY
FINAL REPORT

Date_____

1. (a) Organization Surveyed: _____
_____
_____

(b) Contract No.:_____

(c) Surveyed By:_____

(d) Date of Survey:_____

2. CONCLUSIONS:

(a) through (i) - Paragraphs summarizing results of survey for each of the nine classifications, with particular emphasis on problem areas.

(EXAMPLE)

(f) Subcontractor and Vendor Surveillance: A critical problem exists, as evidenced by failure to meet electrical power specifications, of 47% of delivered items to date. Such failure to meet specification involves more than one-third of all subcontractors who have electrical power specifications to meet. Apparent causes are:

(1) Failure by contractor to require Electrical Power Management Program on the part of subcontractors.

(2) Failure to exercise detailed monitoring of subcontractor design activities.

3. RECOMMENDATIONS.

Recommendations for improvement of contractor's Electrical Power Management Program, and directives for actions to resolve critical problem areas.

(EXAMPLE)

(g) Submit evidence within sixty days that adequate Electrical Power Management requirements have been imposed on all subcontractors.

(h) Submit within 30 days plans for regular, detailed, quantitative, monitoring of subcontractor Electrical Power activities.

4. SURVEY DISCUSSION

(a) General discussion of critical survey results.

(b) Contractor cooperation in survey.

(c) Adequacy of contractor preparation for survey.

(d) Consistency between verbal answers and substantiating evidence.

(e) Contractor innovations in Electrical Power Management, and areas of outstanding performance. (These may be applicable to improving the performance of other contractors.)

5. ATTACHMENTS

Detailed results and data to substantiate, clarify, or expand on items covered in the report.

ERRATA

NASA SP-6007

ELECTRICAL POWER MANAGEMENT SURVEY MANUAL

September 1, 1965

Page 29: Table II Proficiency Rating Form should be replaced with the attached table.

Issued 10-22-65

TABLE II PROFICIENCY RATING FORM

OBJECTIVES / CLASSIFICATION	a PLANNING	b COMMUNICATIONS	c DISCIPLINES	d TRAINING & EDUCATION	e JUDGMENTS	f TECHNICAL	IV SUM a THRU b	V DIVIDE IV BY V AND ENTER IN VI	VI ENGINEERING PROFICIENCY
1 PREPAREDNESS AND ATTITUDES								60	
2 FORMULATION OF REQUIREMENTS								60	
3 FORMULATION OF ELECTRICAL POWER MANAGEMENT SYSTEM								170	
4 ELECTRICAL POWER ANALYSIS								120	
5 DESIGN MONITORING								190	
6 SUB-CONTRACTOR AND VENDOR SURVEILLANCE								120	
7 MEASURED DATA								110	
8 ELECTRICAL POWER CONTROL ASSURANCE								60	
9 SUBMITTALS								100	
I SUM 1 THRU 9							VII *	VIII DIVIDE VII BY 990 ENTER IN IX	IX OVERALL ENG. & ADM. PROF.
II DIVIDE I BY II & ENTER IN III	190	190	190	120	130	170			
III ADMINISTRATIVE PROFICIENCY									

* SUM OF COL. IV (must equal sum of line 1)